also his levellings in the Transcaspian territory in the region which is supposed to have been the *Area Palus* of the ancients, promise to yield very interesting results. The yearly reports of both the East and the West Siberian Branches of the Geographical Society are also full of geographical information. In East Siberia, M. Prein has explored the vegetation of the Olkhon Island in Lake Baikal, which offers great interest for its curious mixture of species characteristic of the steppes with purely forest species, and which also contains a number of varieties, either unknown or intermediary between different formerly known varieties. In West Siberia, we notice the steady work of the Meteorological Committee which opened last year, in connection with the Central Meteorological Observatory, eight stations in different parts of the territory; M. Siyazoff's work on the flora of the Ishim Steppes, and its comparison with the flora of Tyumen, at the eastern slope of the Urals; M. Katanaeff's larger work on the Kirghiz Steppes; and Slovtsoff's, on the Pelym region and on the Siberian cedar—all published in the memoirs of the West Siberian branch—are also of interest.

A REPORT, showing the distribution and production of some of the most important minerals worked in India, has been issued by the Department of Revenue and Agriculture of the Indian Government.

THE principles of the manufacture of steel are ably described in "Fabrication de la Fonte," by M. E. de Billy, the volume being the latest addition to the Aide-Mémoire series published jointly by Gauthier-Villars and Masson.

THE fifth part of Kerner and Oliver's "Natural History of Plants" (Blackie) has been published. Its contents refer to metabolism and the transport of materials, and to the growth and construction of plants.

WE have received a paper "On the Analytical Treatment of Alternating Currents," read by Prof. A. Macfarlane before the International Electrical Congress held at Chicago a year ago, and reprinted from the Congress' *Proceedings*.

ALL regulations referring to the registration and inspection of classes held in connection with the City and Guilds of London Institute are given in the "Programme of Technological Examinations" just published for the Institute by Messrs. Whittaker and Co.

UNDER the title "Peregrinazioni Psicologiche," U. Hoepli, of Milan, has published a collection of psychological papers by Dr. Tito Vignoli, Professor of Anthropology in the R. Accademia Scienze e Lettere di Milano, and Director of the Museo Civico di Storia Naturale.

THE September number of *The Country Month by Month*, by Mrs. Owen and Prof. Boulger, appears to us to be better than some that have preceded it. The poet-naturalist will find the authors' descriptions of autumnal plant and bird life greatly to his liking. Some parts of the book are really very fine. Messrs. Bliss, Sands, and Foster are the publishers.

THE Manchester Microscopical Society, with a membership of 245, ranks high among provincial scientific societies. Several interesting papers are printed in the *Transactions* of the Society for 1893. Among these we note the address of the president, Prof. F. E. Weiss, on recent researches and speculations on the structure of protoplasm; a paper on modern views of the plant cell, by Mr. Thomas Hick; and one on the organic forms of silica, by Mr. W. Blackburn. A useful summary of information on the plans of growth and the forms of Foraminifera is contributed by Mr. E. Halkyard; and a survey of typical examples of some common microscopic fungi is given by Mr. A. T. Gillanders. These papers show that interest in the Society is still maintained.

THE Meteorological Sub-Committee of the Croydon Microscopical and Natural History Club is doing good work by the collection of rainfall statistics; its report for 1893 contains daily and monthly values for sixty-three stations in the counties of Kent and Surrey. The Hon. Sec., Mr. F. C. Bayard, points out that the smallness of the total rainfall during the year is very remarkable. The average yearly fall for Greenwich for seventy-five years (1816-90) is 25·11 inches; but in the year 1893 there was a deficiency of 5·02 inches, which quantity nearly represents the deficiency of the district dealt with by the Club. Most of this deficiency, viz. 4·77 inches, occurred during the first six months of the year.

THE additions to the Zoological Society's Gardens during the past week include a Diana Monkey (*Cercopithecus diana*) from West Africa, presented by Mr. Darent McDonald; a Pinche Monkey (*Midas œdipus*) from New Granada, presented by Lieut.-W. N. Gordon, R.A.; a Puma (*Felis concolor*) from Argentina, presented by Mr. Ponsonby Ogle; a Stone Curlew (*Œdicnemus scolopax*), British, presented by Colonel H. W. Fielden; two Poe Honeyeaters (*Prosthemadera novæ-zealandiæ*), from New Zealand, presented by Mr. Reginald Moorhouse; an Elephantine Tortoise (*Testudo elephantina*) from the Seychelles, presented by Mr. Arthur Gladstone; two Hawks-billed Turtle (*Chelone imbricata*) from the East Indies, presented by Captain E. Fleetham; a black-headed Lemur (*Lemur brunneus*) from Madagascar, five Meyer's Parrots (*Pœocephalus meyeri*) from East Africa; two Brown-throated Conures (*Conurus æruginosus*) from South America, deposited; two Javan Wild Swine (*Sus vittatus*) from Java, presented by Mr. E. J. Kerkhoven.

OUR ASTRONOMICAL COLUMN.

RECENT OBSERVATIONS OF MARS.—Mr. John Ritchie, jun., has kindly sent us a cutting from the Boston *Commonwealth* containing some observations of Mars, made at the Lowell Observatory, Arizona, since those recorded in our issue of August 16. The staff of the observatory includes Mr. Percival Lowell, Prof. W. H. Pickering, and Mr. E. A. Douglass. Mr. Lowell himself communicated the following observations to the *Commonwealth*: July 5. Both Pickering and Douglass observed that the terminator was flattened in a certain place. Light from the Sabacus Sinus was found to be polarised. July 19. Douglass observed a protuberance on the terminator, and a notch. The height of the former was estimated at 0″·1, which suggests an elevation of about five-eighths of a mile. July 20. The notch seen by Douglass was confirmed by Pickering. July 21. Douglass saw two notches which were afterwards confirmed by Pickering, July 23. Other notches on the terminator observed by Douglass. July 26. A large protuberance observed by Pickering. The light from the larger "lakes" found to be unpolarised, even when near the limb of the planet. (Mr. Ritchie points out that the projection seen by Pickering was in all probability the one seen by Javelle at Nice, on July 28). The first observation of a canal, Eumenides, was made on June 6 by Pickering. The same channel was seen by the other observers on June 7, and appeared persistently on June 9. During the whole of June and July the snow-cap diminished in size. On July 10, a minute patch of white, in the position of the former star-like points, was seen as a difficult object, entirely detached from the snow-cap. On July 18, Pickering reported that the cap had materially diminished, and that the canals were coming out more clearly. He had some views of clouds and glimpses of some of his "lakes." Early in August he reported that he had seen seventeen of these lakes, two of them new. By the end of June the canal Ganges was seen twice, and both times single. July 29, a light grey tint was seen on an extended region. Some canals were well developed, no duplication visible. July 30, early in the evening, with the seeing 4 and 3 on a scale of 10, Pickering thought he saw Ganges double. Later in the evening, when the seeing had improved to 8 and 9, it was evident that such was not the case. The

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apparent double was a canal from Fons Juvente and a north branch of Tithonus. The latter observations have an interest, since the canal Ganges has been reported as having been seen double at the Lick Observatory.

A circular just distributed by the Centralstelle für Astronomische Telegramme, Kiel, states that a telegram, of which the following is a translation, was received from Teramo on August 31:—"Greenish-white spot on the northern cap of Mars. Length thirty to forty degrees. *Nix borea* apparently covers *Mare acidalium*. Cerulli."

THE MASS OF JUPITER.—It was more than twenty years ago, Prof. Simon Newcomb reminds us in the *Astronomische Nachrichten* No. 3249, that he called attention to the great value of observations on the minor planet Polyhymnia for determining the mass of Jupiter. Prof. G. C. Comstock's computations of the special perturbations of the elements of the former planet from the date of discovery in 1854, together with the observations made during the opposition of 1888, have enabled Prof. Newcomb to make this determination. The result obtained shows that the mass of Jupiter is $\frac{1}{1047\cdot34}$ part the mass of the sun. Other determinations of Jupiter's mass are shown in the following table, and also the weights assigned to them by Prof. Newcomb, who proposes to regard the weighted mean as definitive, and to use that mass in his work on the planetary theories.

	Jupiter's Mass.	Weight of Determination.
All observations on the satellites ...	1047·82	... 1
Action on Faye's Comet (Möller) ...	1047·79	... 1
Action on Themis (Krueger) ...	1047·54	... 5
Action on Saturn (Hill)	1047·38	... 7
Action on Polyhymnia	1047·34	... 20
Action on Winnecke's Comet (v. Haerdtl)	1047·17	... 10
Weighted mean	1047·35	± 0·065

It is pointed out that in the interests of the astronomy of the future, it is very desirable to apply Gill's heliometer method to the continuous observation of a selected number of minor planets.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE forty-third annual meeting of the American Association for the Advancement of Science was held at Brooklyn, N.Y., from August, 16-22.

The marvel is that no meeting had previously been held in that great city. Overshadowed as it is by the greater metropolis of New York, its next neighbour, many strangers fail to realise that Brooklyn is one of the great cities of the world. By a recent act of the legislature its area has been doubled, and its population now exceeds one million, making it the fourth city in America; until the last census it was the third, but Chicago has now outstripped it.

Not merely as a portion of the metropolis of America, but also in those features which are distinctively peculiar to itself, Brooklyn offers unrivalled attractions to men of science. The massive bridge which spans the East River, connecting it with New York, is a world-renowned triumph of engineering. The United States Navy Yard attracts the attention of those who study applied science, and eleven thousand manufacturing establishments provide valuable object-lessons.

The city is also notable for educational institutions of the best character, including the Pratt Institution, the Packer, the Polytechnic, the Long Island Medical College, the Hoogland Biological Laboratory, a large and well-equipped High School for each sex, and several Roman Catholic Seminaries.

A marked feature of recent meetings of the Association has been the increasing number of affiliated societies which hold meetings in connection with the general Association. Two new accessions bring the number of these already up to nine, and next year the American Botanical Society will still further swell the list, which now includes the American Mathematical Society, the Society for Promoting Engineering Education, the Society for the Promotion of Agricultural Science, the American Microscopical Society, the Geological Society of America, the Association of Economic Entomologists, the American Chemical Society, the Association of State Weather Services, and the American Forestry Association.

The citizens of Brooklyn entered into the arrangements with an evident determination to do everything to insure the success of the meeting. The reception at the Academy of Music and the Art Building, on the opening evening, was perfect in all its details. The excursions were of unusual number and variety, and included features of exceptional scientific interest, such as dredging expeditions by the steamer *Fish Hawk*, furnished by the United States Government. Special mention is also due to the elegant excursion to West End, and entertainment furnished by Mrs. Herrman, a patron of the Association, and of the sterling silver badges of her own design given as souvenirs.

The weather continued cool and comfortable throughout, so that all the external conditions were as favourable as possible. Teleologists even found evidence of providence and prevision in the unusual circumstance that nine century plants bloomed together to welcome the coming Association.

The attendance of members was well above the average of recent years, and if to the registry of the general Association be added the names of specialists attending the affiliated societies, it will raise the total to an aggregate comparing favourably with the largest meetings, notwithstanding that the depression of business and the fear of detention by railroad strikes exerted a deterrent influence.

Three evenings were occupied with popular scientific lectures. Paul du Chaillu spoke on the Vikings, their civilisation and expeditions; Edward D. Cope, on the relation of human structure and physiognomy to those of the other mammalia; and B. E. Fernow, on the battle of the forest.

The annual address of the retiring president, Prof. William Harkness, was on the magnitude of the solar system. An exhaustive account was given of the various methods of measuring the sun's distance. Many of Prof. Harkness' hearers were surprised to learn that but little accuracy has been attained for many years. He states as his conclusion after comparing all the corrected results of these various methods, that the sun's distance is 92,797,000 miles with a probable error of 59,700, and the diameter of the solar system, measured by that of its outermost member, the planet Neptune, 5,578,400,000 miles.

The address of Vice-President George C. Comstock, on binary stars, was of interest, as will be seen from the following extracts. After a general review of the subject, he said that the orbits of forty-two binary stars based on motion of over 80° have been computed. The shortest are δ Equulei and κ Pegasi, each less than twelve years.

ζ Cancri presents a curious study. Two stars less than a second apart revolve in an ellipse; a third star 6″ distant revolves in loops, suggesting an invisible companion. Four binaries have been discovered by the spectroscope: β Aurigæ, revolving in a period of four days; α Virginis, four days; ζ Ursæ Majoris, 105 days; and Algol, three days.

The masses of the visual and of spectroscopic binaries are derived by totally different methods, but both classes of bodies indicate that the sun is an undersized star, a result that is confirmed by other and independent lines of investigation. The small range of values presented by the masses of the stars is remarkable, and points to an unexplained uniformity of size in the heavenly bodies, the average component of a double star having a mass somewhat greater than the mass of the earth.

If binary stars are classified with respect to their type of spectrum, it will be found that on the average the distance of a star possessing a Sirian spectrum is about three times as great as that of a star possessing a solar spectrum, and it will further be found that although stars of the Sirian type are, on the whole, more numerous than solar stars, binaries of solar type outnumber their Sirian fellows three to one.

Four-fifths of the binaries, with periods of less than two hundred years, have orbits smaller than Neptune, while the fastest have orbits between Jupiter and Saturn.

A combination of measured amounts of light with elements of orbit is mass-brightness, or "candle-power per ton" (Young). γ Leonis has more than 1000 times the mass-brightness of 61 Cygni—probably. Confining ourselves to those with well-determined orbits, we find at extremes of the list ϕ Ursæ Majoris, with a mass-brightness fifty-times that of 70 Ophiuchi. The mass-brightness of the sun is probably not much greater than that of 70 Ophiuchi.

It has long been known that if the components of a double

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